

III. *A Letter from Mr. John Clayton Rector of Crofton at Wakefield in Yorkshire to the Royal Society, May 12. 1688. giving an Account of several Observables in Virginia, and in his Voyage thither, more particularly concerning the Air.*

HAVING often times been urged to give an Account of *Virginia*, by several of the worthy Members of the Royal Society, I cannot but, as far forth as I am able, obey Commands whereby I'm so much honour'd, and shew my Respect by my ready Compliance; tho' I am so sensible of my own Weakness and Incapacity to answer your Expectations, that before-hand I must Apologize for my self. And indeed by Sea I lost all my Books, Chymical Instruments, Glasses and Microscopes, which rendred me incapable of making those Remarks and Observations I had designed, they were all cast away in Captain *Wins* Ship, as they were to follow me; and *Virginia* being a Country where one cannot furnish ones self again with such things, I was discourag'd from making so diligent a Scruteny as otherwise I might have done, so that I took very few Minutes down in Writing; and therefore, since I have only my Memory to rely on, which too has the Disadvantage of it's own Weakness, and of the distance of two years since now I left the Country, if future Relations shall in some small Points make out my Mistake, I thought this requisite to justify my Candor; for I ever judg'd it villanous to impose in matters of Fact; but Descriptions of things that depend on memory may be liable to Mistakes, and yet the Sincerity of the Person that delivers them intire.

But hereof I shall be as cautious as possible, and shall rather wave some things whereof I have some Doubts, and am uncapable now of satisfying my self, than in any sort presume too far. The Method I design is, First, to give an Account of the Air, and all such Observations as refer thereto, then of the Water, the Earth and Soil; the Birds, the Beasts, the Fishes, the Plants, the Insects; and lastly, the present state of the Inhabitants: But at present I shall neither trouble you nor my self with any more than an Account of what refers to the Air alone, being conscious the Honourable Society may receive such a Glut with the Imperfection of this, as to excuse me from a farther Relation.

But before I begin, perhaps it may not be impertinent to acquaint you with some things that happen'd in our Voyage. We Sail'd in the Ship *Judith*, Captain *Trim* Commander, 'twas Fly-boat built, about 200 or 250 Tuns; she sprung a considerable Leak. When the Captain had made long and diligent Search, had tried all Methods that Sea-men use upon such occasions, or he could think of all in vain, and that the Leak encreased, he came pensively to consult me. Discoursing with him about it, and understanding that the Ship was Seeled within; so that though the Leak might possibly be in the fore-part, it would fill the whole Cavity betwixt the Seeling and the Planks, and so run into the Hold at all the Crevices of the Seeling up and down: I thereupon conceived, that where it burst in betwixt the Seeling and the Planks, it must needs make some Noise. He told me, they had endeavour'd to find it out that way, and according to custom had clapt Cans to their Ears to hear with; but the working of the Ship, the Tackle and the Sea made such a noise, that they could discover nothing thereby, I happily bethought my self of the Speaking Trumpet; and having one which I had contriv'd for some other Conveniences, of a differing shape

shape from the common sorts, I bid him take it and apply the broad end to the side of the Ship, the narrow end to his Ear, and it would encrease his Hearing as much as it augmented the Voice the other way, and would ward the Ear too from the Confusion of Foreign Noise. Upon the first application, accordingly they heard it, tho' it happen'd to be at a considerable distance; and when they removed the Trumpet nigher, they heard it as if it had been the Current of a mighty River, even so distinctly, as to have Apprehensions of the bigness and Figure of the Hole that the Water came in at; so that cutting there the Seeling of the Ship, they immediately stopt the Leak.

In the Sea I saw many little things which the Seamen call Carvels; they are like a Jelly or Starch that is made with a Cast of Blew in it; they swim like a small Sheeps Bladder above the Water, downwards there are long fibrous strings, some whereof I have found near half a yard long. This I take to be a sort of Sea-Plant, and the strings its Roots growing in the Sea, as Duck-weed does in Ponds. It may be reckon'd among the Potential Cauteries; for when we were one day becalm'd, getting some to make Observations thereof, the sportful People rub'd it on one anothers Hands and Faces, and where it touch'd it would make it look very red, and make it smart worse than a Nettle. In my return for *England* we struck a Hawksbill Turtle, in whose Guts I found many of these Carvels; so that it's manifest they feed thereon. 'Tis commonly asserted by the Seamen, that they can smell the Pines at *Virginia* several Leagues at Sea before they see Land, but I could receive no satisfaction as to this Point; I could not discern any such thing when at a moderate distance, I fear much of this may be attributed to Fancy; for one day there came three or

four full sent to tell me they were certain they smelt the Pines ; but it afterwards prov'd that we were at that time 200 Leagues from the Shoar, so that I was satisfied that was therefore meer Fancy. Indeed we thought, by the general Accounts of the Ship, that we had been just on the Coast, but all were deceived by a Current we met with, that at that time set about South-East, or East South-East, which when once becalmed we tried thus : We hoisted out a Boat, and took one of the Scuttles that cover'd one of the Hatches of the Ship, tying thereto a great Weight, and a strong long Rope, we let it sink a considerably Depth, and then fastning it to the Boat, it serv'd as an Ancor, that the Boat could not drive ; then with the Glafs and logg Line we found the Current set, as I say, Eastward, at the rate of a Mile and a half an hour. This Current is of mischievous Consequence, it does not always run one way, but as it sets sometimes as we proved Easterly, so does it, as they say, set at other times Westerly, whereby many Ships have been lost ; for then the Ships being before their Accounts, they fall in with the Land before they are aware. Thus one year many Ships were lost on Cape *Hattarasse*, and thereabouts.

Of the Aire.

THE Cape called *Cape Henry*, lies in $36\frac{1}{2}$ of the Northern Latitude. The Air and Temperature of the Seasons is much govern'd by Winds in *Virginia*, both as to Heat and Cold, Driness and Moisture, whose Variations being very notable, I the more lamented the loss of my Barometers and Thermometers, for considerable Observations might be made thereby, there being often great and suddain Changes. The Nore and Nore-West are very nitrous and piercing, cold and clear, or else stormy.

stormy. The South-East and South hazy and foultry hot: Their Winter is a fine clear Air, and dry, which renders it very pleasant : Their Frosts are short, but sometimes very sharp, that it will freeze the Rivers over three miles broad ; nay, the Secretary of State assured me, it had frozen clever over *Potomack* River, over against his House, where it is near nine Miles over, I have observed it freezes there the hardest, when from a moist South-East, on a suddain the Wind passing by the Nore, a nitrous sharp Nore-West blows ; not with high Gusts, but with a cutting brisk Air ; and those Vails then that seem to be shelter'd from the Wind, and lie warm, where the Air is most stagnant and moist, are frozen the hardest, and seized the soonest, and there the Fruits are more subject to blast than where the Air has a free Motion. Snow falls sometimes in pretty quantity, but rarely continues there above a day or two : Their Spring is about a Month earlier than in *England* ; in *April* they have frequent Rains, sometimes several short and suddain Gusts. *May* and *June* the Heat encreases, and it is much like our Summer, being mitigated with gentle Breezes, that rise about Nine of the Clock, and decrease and incline as the Sun rises and falls. *July* and *August* those Breezes cease, and the Air becomes stagnant, that the Heat is violent and troublesom. In *September* the Weather usually breaks suddenly, and there falls generally very considerable Rains. When the Weather breaks many fall sick, this being the time of an Endemical Sickness, for Seasonings, Cachexes, Fluxes, Scorbatical Dropsies, Gripes, or the like, which I have attributed to this Reason. That by the extraordinary Heat the Ferment of the Blood being raised too high, and the Tone of the Stomach relaxed, when the Weather breaks the Blood palls, and like over-fermented Liquors is depauperated, or turns eager and sharp, and there's a crude Digestion, whence the named Distempers may be supposed

posed to ensue. And for Confirmation, I have observed the Carminative Seeds, such as warm, and whose Oil sheaths the acid Humours that ever result from crude Digestions. But Decoctions that retain the Tone of the Stomach, as I suppose, by making the little Glands in the Tunics of the Stomach, squeeze out their Juice, (for what is bitter may be as well offensive to the Stomach, as to the Palat) and then Chalibiates that raise the decayed Ferment, are no bad Practice; after which, I conceive, Armoniack Spirits might be very beneficial. But their Doctors are so Learned, that I never met with any of them that understood what Armoniack Spirits were: Two or three of them one time ran me clear down by consent, that they were vomitive, and that they never used any thing for that purpose but *Crocus Metallorum*, which indeed every House keeps; and if their Finger, as the Saying is, ake but, they immediately give three or four spoonfuls thereof; if this fail, they give him a second Dose, then perhaps purge them with 15 or 20 Grains of the Resin of Jalap, afterwards sweat them with Venice Treacle, Powder of Snake-Root, or *Gascoins* Powder; and when these fail *conclamatum est*. But to return, 'Tis wonderful what Influence the Air has over Mens Bodies, whereof I had my self sad Assurances; for tho' I was in a very close warm Room, where was a Fire constantly kept, yet there was not the least Alteration or Change, whereof I was not sensible when I was sick of the Gripes, of which Distemper I may give a farther account in it's proper place. When a very ingenious Gentlewoman was visited with the same Distemper, I had the opportunity of making very considerable Observations. I stood at the Window, and could view the Clouds arise: For there small black fleeting Clouds will arise, and be swiftly carry'd cross the whole Element; and as these Clouds arose, and came nigher, her Torments were encreased, which were grievous as a labouring Womans; there

there was not the least Cloud but lamentably affected her, and that at a considerable distance ; but by her Shrieks it seem'd more or less, according to the bigness and nearness of the Clouds. The Thunder there is attended often with fatal circumstances : I was with my Lord *Howard* of *Effingham* the Governour, when they brought word that one Dr. *A.* was killed therewith, after this manner : He was smoaking a Pipe of Tobacco, and looking out at his Window when he was struck dead, and immediately became so stiff, that he did not fall, but stood leaning in the Window, with the Pipe in his Mouth in the same posture he was in when struck : But this I only deliver as Report, tho' I heard the same Account from several, without any contradicting it. These things are remarkable, that it generally breaks in at the Gable end of the Houses, and often kills Persons in, or near the Chimneys Range, darting most fiercely down the Funnel of the Chimney, more especially if there be a Fire, (I speak here confusedly of Thunder and Lightning) for when they do any Mischief, the Crash and Lightning are at the same instant, which must be from the nearness of the Cloud. One time when the Thunder split the Mast of a Boat at *James Town*, I saw it break from the Cloud, which it divided in two, and seem'd as if it had shot them immediately a Mile asunder, to the Eye : It is dangerous when it Thunders standing in a narrow passage, where there's a thorough passage, or in a Room betwixt two Windows ; tho' several have been kill'd in the open Fields. 'Tis incredible to tell how it will strike large Oaks, shatter and shiver them, sometimes twisting round a Tree, sometimes as if it struck the Tree backwards and forwards. I had noted a fine spreading Oak in *James Town* Island, in the Morning I saw it fair and flourishing, in the Evening I observed all the Bark of the Body of the Tree, as if it had been artificially peel'd off, was orderly spread round the Tree, in

a Ring, whose Semidiameter was Four Yards, the Tree in in the Center ; all the Body of the Tree was shaken and split, but its Boughs had all their Bark on ; few Leaves were fallen, and those on the Boughs as fresh as in the Morning, but gradually afterwards withered, as on a Tree that is fallen. I have seen several vast Oaks and other Timber Trees twisted, as if it had been a small Willow that a Man had twisted with his Hand, which I could suppose had been done by nothing but the Thunder. I have been told by very serious Planters, that 30 or 40 years since, when the Country was not so open, the Thunder was more fierce, and that sometimes after violent Thunder and Rain, the Roads would seem to have perfect casts of Brimstone ; and 'tis frequent after much Thunder and Lightning for the Air to have a perfect Sulphureous Smell. Durst I offer my weak Reasons when I write to so great Masters thereof, I should here consider the nature of Thunder, and compare it with some Sulphureous Spirits which I have drawn from Coals, that I could no way condense, yet were inflamable ; nay, would burn after they pass'd through Water, and that seemingly fiercer, if they were not over-power'd therewith. I have kept of this Spirit a considerable time in Bladders ; and tho' it appeared as if they were only blown with Air, yet if I let it forth, and fired it with a Match or Candle, it would continue burning till all were spent. It might be worthy Consideration likewise, whether those frequent Thunders proceeded from the Air's being more stagnant, the Motion of the Winds being impeded by the Trees, or whether the Motion of the Winds being obstructed by them below, the Motion might not be more violent aloft ; and how far that may promote Inflammability, for Stacks of Hay or Corn that ferment with Moisture, never burn, unless when brisk Winds blow, that agitate and fan the little fermenting Sparks, and

and oft kindle them into an actual Fire. An Observance of the Meteors there might perhaps not be impertinent, as both what are more rare, and what are more frequent, as of *Gosmore* in great abundance, and of those small Cobwebs in a Morning, which some have supposed to be Meteors. *Ignes fatui*, tho there be many boggy Swamps and Marshes, are seldom, if any are seen there. There be frequent little sorts of Whirl-winds, whose Diameter may be sometimes not past two or three Yards, sometimes Forty, which whisking round in a Circle, pass along the Earth, according to the Motion of the Cloud, from whence they issue; and as they pass along with their gyrous or circular Motion, they carry aloft the drie Leaves into the Air, which fall again often in places far remote. I have seen them descend in a calm Sun-shine Day, as if they had come from the Heavens in great Showers thereof, so that all the Elements seem'd filled therewith. And I could perceive them to descend from on high as far as I could possibly discern a Leaf. I remember a roguish Expression of a Seaman, otherwise silly enough, who wondering thereat, cry'd out, *Sure now 'tis manifest there is a World above!* and now with them 'tis the Fall of the Leaf. But to proceed, I thought this made it manifest, whence many preternatural Showers have happen'd. I remember at Sir *Richard Atherton's* in *Lancashire*, some few years ago, there fell a great number of the Seeds of Ivy-berries; at first we admir'd what they were, for they were cover'd with a thin skin that was red, and resembled the Figure of a small Wheat Corn; but afterwards they fully manifested what they were; for many sprouted and took Root. I suppose they were carry'd aloft by some such Whirl-wind, and let fall there. I have purposely gone into the place where I perceiv'd this Gust, which is notorious enough by the noise it makes, with rattling the Leaves as it carries them aloft, and have found a fine sharp Breeze of Wind. *Tours, &c.* K k Mr.

Mr. Clayton's Second Letter , containing his farther Observations on Virginia.

BEING honour'd with the Thanks of the Society for my last, and receiving by my worthy Friend Dr. *Moulin* their Commands to proceed, I have added here my Observations of the Waters, and part of the Earth and Soil. I shall wave both Complements and Apologies, since I have greater Respect and Honour for the Society than I can possibly express, and have no reason to suspect their Favour, whose Candidness I so signally proved in my last.

Of the Waters.

TWIXT the two Capes, the Southern, call'd the *Cape Henry*, the more Northerly call'd *Cape Charles*, there runs up a great Bay, call'd the Bay of *Cheespeak*; Nine Leagues over in some places, in most Seven, lying much West, Nore and South, dividing *Virginia* into two unequal parts. On the East side of this Bay there lies a narrow Neck of Land, which makes the Counties of *Northampton* and *Accomack*. On the West side of the Bay there branches forth four great Rivers, *James River*, *York River*, *Rapahanack* and *Potomack*, that rise from a Ridge of Mountains, whereof more in the Sequel. These Rivers plentifully water all the other parts of *Virginia*, emptying themselves into the great Bay. The Mouth of *James River*, which is the most Southerly of them, to the Mouth of *Potomack*, which is the most Northerly, may be a hundred Miles distance: But as I have been credibly inform'd, that the Falls of *James River* are not past Thirty Miles from *Potomack*, which is

a vast large River Nine Miles over in many places. I have been told it was Navigable nigh Two Hundred Miles, much higher than any of the other Rivers: Whence I conclude in future times, it will be the most considerable for Trade when the Country comes to be inhabited further up into the main Land. The other Rivers are much about Three Miles over apiece. And *James River* is Navigable at least Eighty Miles. Within Four or Five Miles of *James Town*, *James River* and *York River* are not past Four or Five Miles asunder. Yea, Sloops of considerable Carriage may Sail up the Branches of the two Rivers, till they come within a Mile the one of the other; for I take it to be no more from Col. *Bollard's* to Major *Troop's* Landing; and I believe they may come much what as near again as Col. *Coles*, and several other places. *York River* is distant from *Rapahanack* in some places not past Ten or Twelve Miles, *Rapahanack* from *Potomack* not past Seven Miles in one place, tho' it may be Sixty in others. The Heads of the Branches of the Rivers interfere and lock one within another, which I think is best expressed after the manner that an *Indian* explained himself once to me, when I enquired how nigh the Rivers of *Carolina*, *Virginia* and *Maryland* arose out of the Mountains, from those that ran West-erly on the other side of the Mountains, he clapt the Fingers of one Hand 'twixt those of the other, crying, they meet thus; the Branches of different Rivers rising not past a hundred Paces distant one from another: So that no Country in the World can be more curiously watered. But this Convenience, that in future times may make her like the *Netherlands*, the richest place in all *America*, at the present I look on the greatest Impediment to the Advance of the Country, as it is the greatest Obstacle to Trade and Commerce. For the great number of Rivers and the thinness of the Inhabitants distract and disperse a Trade. So that all Ships in general

gather each their Loading up and down an hundred Miles distant ; and the best of Trade that can be driven is only a sort of *Scotch* Pedling ; for they must carry all sort of Truck that trade thither, having one Commodity to pass off another. This (*i.e.*) the number of Rivers, is one of the chief Reasons why they have no Towns ; for every one being more sollicitous for a private Interest and Conveniency, than for a publick, they will either be for making Forty Towns at once, that is, two in every County, or none at all, which is the Countries Ruine. But to return, The Tides in these Rivers regularly ebb and flow about two foot perpendicular at *James Town* ; there is there, as they call it, a Tide and half Tide, that is, it flows near two hours along by the Shoar, after that it is Ebb in the Channel, and again it ebbs near two Hours by the Shore, after that it is Flood in the Channel. This is great advantage to the Boats passing up and down the River. I suppose this is caused by many Creeks and Branches of the Rivers, which being considerable many, tho' only three or four Miles long, yet as broad as the *Thames* at *London* ; others Ten Miles long, some above Twenty, that have little fresh Water which they carry of their own, but their Current primarily depending upon the Flux and Reflux of the Sea. So that after the Tide is made in the Channel, it flows by the Shoar a considerable time afterwards, being that those Creeks are still to fill, and therefore as it were draws a Source upwards by the Shoar ; and likewise when the Tide returns in the Channel, the Creeks that could not so readily disburse their Water, being still to empty themselves, they make an ebbing by the Shoar a considerable time after that it is Flood, as I say, in the Channel. So far as the Salt Waters reach the Country is deemed less healthy. In the Freshest they more rarely are troubled with the Seasonings, and those Endemical Distempers about *September* and *October*. This being very remarkable,

remarkable, I refer the Reason to the more piercing Genius of those most judicious Members of the Society : And it might perhaps be worthy the Disquisition of the most Learned to give an Account of the various Alterations and fatal Effects that the Air has on humane Bodies, especially when impregnated with a Marine Salt ; more peculiarly when such an Air becomes stagnant : This might perhaps make several beneficial Discoveries, not only in relation to those Distempers in *America*, but perhaps take in your *Kentish* Agues, and many others remarkable enough in our own Nation. I lately was making some Observations of this Nature on a Lady of a delicate Constitution, who living in a clear Air, and removing towards the Sea-Coast, was lamentably afflicted therewith, which both my self and others attributed to this Cause, she having formerly upon her going to the same been seized in the same manner. But to return : There is one thing more in reference to this very thing, very remarkable in *Virginia*, generally twice in the year, Spring and Fall, at certain Spring Tides, the most of the Cattle will set on gadding, and run, tho' it be twenty or thirty Miles, to the River to drink the Salt Water, at which time there's scarce any stopping of them ; which the People know so well, that if about those times their Heards are stray'd from their Plantations, without more sollicitation they go directly to the Rivers to fetch them home again. As for the Waters in the Springs in general, they are, I think, somewhat more eager than those in *England*. In that I have observed, they require some quantity more of Mault to make strong Beer than our English Waters, and will not bear Soap. I have try'd several by infusing of Galls, and found little difference in the Colours, turning much what the Colour of common Sack in Taverns. I tried two Wells at Col. *Bird's*, by the Falls of *James River*, several Wells near *James Town*, some Springs in the *Isle* of

of *Wight County*: There's a Spring in the *Isle of Wight* or *Nanzamond County* vents the greatest Source of Water I ever saw, excepting *Holy Well* in *Wales*, but I had not opportunity to make experiments thereof. I tried likewise some Springs on the Banks of *Tork River*, in *New Kent* and *Gloucester County*, but found them vary very little as to Colour. I could not trie any thing as to their specifick Gravity, having neither *Aquapoisie*, nor those other Glasses I had contrived peculiarly for making such Experiments, they being all lost with my other things. I had Glasses blown would hold about Five Ounces, others about Ten Ounces, with Necks so small, that a Drop would make a considerable Variation; with these I could make much more critical and satisfactory Observations as to the specifical Gravity of Liquors, having Critical Scales, than by any other way yet by me tried. I used this method to weigh Urines, which Practice I would recommend to the inquisitive and critical Physicians. I had made many Observations hereof, but all Notes were likewise lost with my other things. Yet I have begun afresh; for there are more signal Variations in the Weights of Urines than one would at first imagine; and when the Eye can discover little, but judge two Urines to be alike, they may be found to differ very much as to Weight. By Weight I find Observations may be made of Affections in the Head, which rarely make any visible Alterations in the Urine. I have found two Urines not much unlike differ two and twenty Grains in the quantity of about four or five Ounces: But let them that make these Essays weigh all their Urines when cold, lest they be thereby deceiv'd. But to return to the Spring Waters in *Virginia*. There's a Spring at my Lady *Berkley's*, called *Green-Spring*, whereof I have been often told, so very cold, that 'tis dangerous drinking thereof in Summer-time, it having proved of fatal Consequence to several. I never tried any thing of what nature it is of.

There

There be many petrefying Waters; and indeed I believe few of the Waters but participate of a petrefying quality, tho' there be few Pebbles or paving Stones to be found in all the Country. But I have found many Sticks with crusty Congelations round them in the Runs of Springs, and Stones figured like Honey-combs, with many little Stars as it were shot in the Holes. And nothing is more common than petrefy'd Shells, unless you would determine that they are parts of natural Rock shot in those Figures, which indeed I rather think; but thereof hereafter. Mr. Secretary *Spencer* has told me of some Waters participating much of *Alome* or *Vitriol* towards *Potomack*. Up beyond the Falls of *Rapahanack* I have heard of Poysonous Waters. But these I only mention as a Hint to further Enquiry of some others, for I can say nothing of them my self.

The remainder of this Letter being his Observations on the Earth and Soil of Virginia shall be reserved for the next Transaſtion.
